

**UNITED STATES BANKRUPTCY COURT  
SOUTHERN DISTRICT OF TEXAS  
(Corpus Christi Division)**

<b>In re</b>	§	<b>Case No. 05-21207</b>
	§	
<b>ASARCO, LLC, et al.</b>	§	<b>Chapter 11</b>
	§	
<b>Debtors</b>	§	<b>Jointly Administered</b>
	§	

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**Expert Name:** Paul R. Ammann  
**Retention on behalf of:** U.S. Department of Justice

**PROFFER OF DIRECT TESTIMONY OF PAUL R. AMMANN**

## **Introduction:**

The following information is a true and accurate statement of my testimony in this case.

### **A. Brief Summary of Opinions**

This opinion estimates future environmental costs that will be incurred by the U.S. Environmental Protection Agency (“EPA”) at Operable Unit (“OU”) 3 of the Coeur d’Alene Superfund Site (“Site”). Based on the information I have reviewed in this matter, I conclude that future environmental remediation costs at the Site have an expected value of approximately \$2,053.7 million in present value dollars as of June 30, 2008<sup>1</sup> based on EPA assuming all responsibility for the future remedial activities. In addition, the U.S. Department of Justice has asked me to collect and summarize the costs put forth by other government experts. These experts opined on such issues as past costs for EPA, the U.S. Department of Justice, and other federal agencies, as well as Natural Resource Damages. When including those costs, and removing possible overlapping costs, the total is \$2,564.7 million.

### **B. Expert Qualifications**

I was a Co-founder and Principal of *The Brattle Group*, an international economic, management, and environmental consulting firm with offices in Cambridge, MA; Washington, DC; San Francisco, CA; London, United Kingdom; and Brussels, Belgium. Since 2001, I have continued a consulting relationship with *The Brattle Group* as a Senior Advisor. I have over twenty-five years of industrial experience in the development and engineering analysis of environmental, chemical, and metallurgical technologies. During part of that time I was also employed by a major U.S.-based non-ferrous metals and mining company. For the last twenty-five years I have focused on technology and environmental consulting for corporations and law firms. My experience includes evaluating chemical and manufacturing technology developments, environmental compliance strategies, developing costs for new technologies and

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<sup>1</sup> This is the estimated bankruptcy award date that I have been instructed to use for all estimates. Once an award date is determined, present value calculations should be re-evaluated to reflect the actual award date.

products, and estimating future environmental costs. I have authored or co-authored and presented a number of professional papers in these areas, and I have testified in Federal Court. I have B.S. and M.S. degrees in chemical engineering from the Massachusetts Institute of Technology. For more detail as to my qualifications as an expert witness, please refer to the Introduction of my Expert Report of June 15, 2007, beginning on page 1, as well as my detailed Curriculum Vitae in Appendix A. (Exhibit #USCdA032).

### **C. Statement of Opinions**

1. I have been asked by the U.S. Department of Justice to estimate future environmental costs related to OU 3 of the Site beginning January 1, 2007 and ending in the year 2106, using available engineering and cost information. The one-hundred-year period represents an in-perpetuity commitment of on-going operations and maintenance (“O&M”), monitoring, institutional control programs, and governmental oversight. To support my analysis, I reviewed substantial documentation about the Site and toured the Coeur d’Alene Basin. I also interviewed EPA staff and other individuals with first-hand experience and knowledge of the Site. Most importantly, I have reviewed the Comprehensive Remedy planned by EPA for addressing threats to human health and the environment at the Site as presented in the testimony of Cami Grandinetti, a Civil Engineer and Unit Manager in EPA Region 10 in her June 14, 2007 expert report (Exhibit #USCdA005). EPA’s Comprehensive Remedy is divided into two major components: Protection of Human Health and Ecological Protection. The latter component was further divided into (1) the Upper Basin; (2) the Lower Basin including Coeur d’Alene river, adjacent lateral lakes, flood plains, and associated wetlands; (3) Lake Coeur d’Alene; and (4) depositional areas of the Spokane River. See Figure 1 in Appendix A for a time line of the remedial components (hereinafter referred to as “Figure \_\_”).

2. I find the remedial activities planned by EPA to be reasonable for addressing the human health and environmental problems in the Basin, and I have developed my cost estimate

in accordance with sound engineering practice and guidelines accepted by ASTM.<sup>2</sup> The bases for my calculations are the current construction (direct and indirect) and annual operating cost estimates from the Feasibility Study<sup>3</sup> as updated by URS Corporation<sup>4</sup> (Exhibit #USCdA007), a consultant for EPA, and discussions with EPA, the ultimate decision-making entity at the Site. In this proffer, I summarize the major future cost and timing components, including remediation activities and EPA direct and indirect costs, which lead to my expected value estimation of approximately \$2,053.7 million for future costs (in present value dollars as of June 30, 2008). See Figure 11.

3. **Methodology:** In preparing the cost estimates, I have made the costs consistent in terms of the timing of the expenditures by applying an inflation factor to estimates prepared in dollar values prior to June 2007. Therefore, if I have an estimate in year 2005 dollars I use the Construction Cost Index (“CCI”)<sup>5</sup> to bring costs to June 2007 dollars. To inflate these costs in future years to nominal dollars, that is, in the dollar amounts that are expected to be spent in each future year, including the effects of inflation, I take the estimates in June 2007 dollars and inflate them by the forecast for Consumer Price Index (“CPI”).<sup>6</sup> I then calculate a present value to June

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<sup>2</sup> ASTM International (formerly known as the American Society for Testing & Materials) authored the “Standard Guide for Estimating Monetary Costs and Liabilities for Environmental Matters” (Exhibit #USCdA036) which I refer to in this proffer.

<sup>3</sup> URS Greiner in association with CH2M Hill White Shield, Inc., “Final (Revision 2) Feasibility Study Report, Coeur d’Alene Basin Remedial Investigation/Feasibility Study,” October 2001 (“Final Feasibility Study”). See Exhibit #USCdA003.

<sup>4</sup> URS Corporation, “Estimated Cleanup Costs for the Coeur d’Alene Basin, Costs Escalated to December 2006 and Pine Creek Costs Excluded,” Draft as of June 8, 2007 (“URS June 2007 Cost Update”). This memorandum updated costs from the Final Feasibility Study. See Exhibit #USCdA007.

<sup>5</sup> The Construction Cost Index values are collected in the *Engineering News Record* or at <http://enr.construction.com/>.

<sup>6</sup> See the March 10, 2007 *Blue Chip Economic Indicators*. Over long periods of time, the Consumer Price Index (“CPI”) and the Construction Cost Index (“CCI”) used to inflate past costs to 2006 have performed similarly. For example, over the past ten years, the CCI has increased on average at a rate slightly faster than CPI (3.3 percent versus 2.5 percent), while over the last twenty years the CCI and CPI have grown at nearly identical rates (3.0 percent versus 3.1 percent).

30, 2008 using the method described by M. Alexis Maniatis in Appendix C of my report dated June 15, 2007 (Exhibit #USCdA032).<sup>7</sup>

4. *Protection of Human Health in the Community (Figure 2)*: One consequence of the decades of mining and ore processing to produce precious metals, lead, and zinc in the Upper Basin has been the contamination of residential (including interiors) and commercial properties, adjacent roadways, community areas, recreational areas, and private drinking water sources in both the Upper and Lower Basins. Also, fish in the Basin waters are vulnerable to ingesting contaminants, thereby representing a threat to human health. Since the issue of the Record of Decision (“Interim ROD”) in September 2002 (Exhibit #USCdA002), EPA has implemented a number of remedial projects including the excavation of contaminated soils from private and commercial properties, street rights-of-ways, and recreational areas such as beaches and boat landings; the completion of a number of public water connections, and point-of-use and new well installations for drinking water replacement; and initiation of the lead intervention and public information program. However, as of 2007, an extensive amount of remedial work remains in both the Upper and Lower Basins to protect human health.

5. EPA plans to complete the Human Health Remedy in 2010 or in four years. See Figure 1. The remaining activities include excavating contaminated soils from private and commercial properties, street right-of-ways, and recreational areas; extensive cleaning of the interiors of homes as part of the House Dust and Vacuum Loan programs; implementing additional aspects of the drinking water replacement program; and monitoring of aquatic food sources through the fish sampling component of the Human Health Program on a five-year cycle indefinitely. In addition, costs for the Information and Intervention Program are included in my

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<sup>7</sup> The Maniatis report also has the following citation: USCdA065– Expert Report of M. Alexis Maniatis (Omaha Exhibit US095, OMAHA 018086 - 018117). Mr. Maniatis also gave testimony at the Omaha hearing: USCdA064 – Omaha Proffer of Direct Testimony of M. Alexis Maniatis, 8/01/2001 (Omaha Exhibit US205, OMAHA 113807 - 113815)

estimate which must run in-perpetuity. I calculate the present value for costs associated with the activities of the Human Health Program at approximately \$164 million. See Figure 2.

6. In making my estimate of future costs, I excluded the costs from the URS June 2007 Cost Update (Exhibit #USCdA007) estimate for activities that have already been completed. For example, five of the 27 recreational areas listed in Table 12.1-13 of the 2002 Interim ROD (Exhibit #USCdA002) have been completed prior to January 1, 2007, and therefore are not included in the future costs.

7. LECG, consultant for the debtor, has made several adjustments to the updated Human Health Remedy estimate in the Feasibility Study that undervalue the costs. For example, LECG reduces the contingency factor used to forecast costs for the remediation of the residential properties and rights-of-ways remedy from 30 percent to 10 percent even though there is significant uncertainty with respect to future costs, and the number and size of remaining properties. See Exhibit #USCdA119, page 3. This is in direct contradiction to the cost estimates and planned activities put forth by EPA at the Site.

8. ***Ecological Protection in the Upper Basin (Figure 3):*** The Upper Basin, where most of the mining and ore processing (milling) activities took place historically, has been a primary source of lead-bearing sediments and soluble metals, such as cadmium and zinc, in the surface waters of the Coeur d'Alene River corridor. EPA's Comprehensive Remedy (based on Alternative 3 in the Final Feasibility Study in Exhibit USCdA003 and 2002 Interim ROD in Exhibit USCdA002) addresses the major source areas in the Upper Basin beginning in 2008. It is an extension of the scope of the remedial activities described in the 2002 Interim ROD. According to the Comprehensive Remedy, the amount of lead and zinc discharged into the Lower Basin and the Spokane River will be reduced significantly before remedial work begins in the Lower Basin, a strategy that is consistent with the recommendations of the National

Academy of Sciences (“NAS”).<sup>8</sup> The watersheds contain a number of abandoned former mine and mill sites, waste rock piles, mill tailings, and areas of contaminated floodplain. Each of these areas is a source of soluble metals and sediments containing lead that eventually migrate into the Coeur d’Alene River system. There are also areas of contaminated groundwater that seep into surface waters at lower elevations. Abandoned mill tailings piles and mine and mill structures are present in the watersheds.

9. Generally the remedial approach consists of moving mine waste materials out of the floodplain and out of the creek channels, to the extent possible, consolidating materials, and providing a cap and vegetation to prevent/minimize surface waters from contacting the metal-bearing wastes. Seepages from mine workings would be collected and treated in a centralized facility. In some circumstances contaminated groundwater would be extracted and treated. Some sediments in the floodplains would be excavated and transported to a local or regional repository. Banks along some portions of the creeks would require bioengineering work to prevent removal of contaminated materials from the banks and transport into surface water, especially during high flow events such as spring runoff. EPA plans to start this work in 2008 running for 20 years, with O&M continuing in-perpetuity. See Figure 1. I have calculated the present value of the future remediation of the Upper Basin at approximately \$681 million in year 2008 dollars, which does not include estimated costs for work already completed for design and engineering activities. See Figure 3.

10. In its latest of multiple reports,<sup>9</sup> LECG presents the notion that the Interim ROD, which contains some remedial work in both the Upper and Lower Basins, will be implemented over a 30-year period from 2007-2033. See Exhibit #USCdA119, Decision Tree ##3 and 4. In

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<sup>8</sup> National Academy of Sciences, “Superfund And Mining Megsites, Lessons Learned From The Coeur d’Alene River Basin,” National Research Council, Washington, DC, 2005. See Exhibit #USCdA016.

<sup>9</sup> Supplemental Expert Report of Jeffrey Zelikson and Richard Lane White, September 21, 2007. See Exhibit #USCdA119.

LECG's view, the actual remedial construction work would be completed in the years 2007 through 2011 for the Upper Basin followed by 22 years of O&M. *Id.* at Decision Tree #3. Moreover, LECG has work specified in the Interim ROD for the Lower Basin occurring from 2012-2018. *Id.* at Decision Tree #4. According to LECG's concept, EPA will wait until 30 years from the issue of the 2002 Interim ROD to conduct the remainder of the extensive and needed source control in the Upper Basin covered under EPA's Comprehensive Remedy. Then LECG assumes that there is only a 30 percent probability that EPA would conduct the additional source control work in the Upper Basin, which even the NAS recommends be completed before beginning any work in the Lower Basin. *Id.* at Table 1B under "Note" and Decision Tree #5. It is clearly unreasonable to assume that EPA would suspend all source control work in the Upper Basin between 2011 and 2033, and then conclude that there is only a 30 percent chance that further work would be undertaken after 2033.

11. ***Ecological Protection in the Lower Basin (Figure 4):*** The Lower Basin consists of the Coeur d'Alene River channel between the confluence of the North and South Forks near Enaville and Lake Coeur d'Alene at Harrison. Five remedial categories in the Lower Basin are described in the Final Feasibility Study: (1) river banks and levees, (2) sediments beds along the Lower Coeur d'Alene River Basin, (3) wetlands and floodplains, (4) sediments in the Lateral Lakes, and (5) delta sediments. Sediments and river banks are highly contaminated with lead and zinc, and not only pose a threat to the environment but also to people using the area for recreational purposes. EPA plans to remove the most highly contaminated areas and store them in secure repositories. The proposed work has a five-year design period preceding each of the two major areas of activity: (1) the lateral lakes, and (2) the beds and banks. See Figure 4. The work then proceeds over 15- and 25-year periods, respectively, with work completed over 40 years, in a manner consistent with an adaptive management program; O&M will run indefinitely. See Figure 1.

12. EPA's plan for the Lower Basin is practical. Because the remedial work in the lateral lakes and in the wetlands does not begin until 2018, EPA has allowed 10 years to site and construct additional repositories for the wastes. See Figure 1. Also, this work does not begin until a significant fraction of the source control in the Upper Basin is completed. The schedule includes five years of engineering and pilot work prior to beginning any of the excavation and dredging operations in the Lower Basin to minimize short-term risks during full scale operations. All excavation, transport, and disposal operations are within current state-of-the-art. I have calculated the present value of the remedial costs for the Lower Basin at approximately \$597 million in year 2008 dollars. See Figure 4.

13. LECG asserts that difficulties in the excavation, transportation, and disposal of some 20 million tons of dredged and excavated soils from the Lower Basin may prevent the implementation of EPA's ecological remedy. See Exhibit #USCdA117, page 8. NAS also identified this as a potential remedial challenge. However, EPA has allowed ten years to secure and develop the repository capacity, as described above. Further, the mining companies have already constructed a suction dredge near Cataldo in order to dredge and dispose of approximately 34 million tons of tailings from the Coeur d'Alene River between 1932 and 1968, demonstrating the technology is available for work of this scale. (Exhibit #USCdA016, page 34). Modern equipment should improve the process, and EPA, in its Comprehensive Remedy, allows five years to conduct engineering and pilot demonstrations. Mining companies typically move large quantities of ore and ore tailings on a daily basis at rates that are much higher than those proposed for the excavation and disposal of the river sediments. In LECG's scenario for the "Interim ROD Remedy" only a fraction of the remedial work in the Upper Basin will have been completed when some of the remediation work in the Lower Basin is undertaken. See Exhibit #USCdA119, Decision Tree ##3 and 4. This plan is in direct contradiction to the recommendations of the NAS. In EPA's Comprehensive Remedy, remediation in the Lower Basin is delayed until most of the remedial activities in the Upper Basin are completed.

14. ***Spokane River (Figure 5):*** A number of areas along the river in the State of Washington have been contaminated with arsenic, cadmium, copper, lead, and zinc in soils and sediments. To date one site of eleven has been cleaned, and the cost for that work strongly suggests that the remaining work will fall in the upper range of the most recent cost estimates. Therefore, I have calculated present value for future costs at approximately \$15.6 million in year 2008 dollars for work planned for the four-year period between 2007 and 2010. See Figures 1 and 5.

15. ***Lake Management Plan (Figure 5):*** EPA maintains that there is a 10 percent probability that the EPA may be required to take responsibility for the Lake Management Plan (“LMP”) in the future (assumed to be year 2030, or the first five-year review after completion of the work in the Upper Basin) and other potential remedial actions to address contamination in the Lake. I have calculated the future costs for the LMP; the present value is approximately \$1.4 million in year 2008 dollars. See Figures 1 and 5. LECG appears to ignore the possibility that EPA may incur additional costs if it is required to implement the LMP in the future.

16. ***Five-Year Reviews (Figure 6):*** As long as there is contamination at the Site, a site review is required every five years indefinitely. The next Five-Year Review will be in 2010 at a cost of \$1.5 million in year 2007 dollars; the Five-Year Reviews will occur every five years in perpetuity. The present value for Five-Year Reviews through year 2105 is approximately \$11.5 million in year 2008 dollars. See Figure 6. Even though LECG has adopted the value \$1,500,000 cost per review, its total cost estimate is not \$11.5 million in year 2008 dollars due to the use of a higher discount rate and earlier base year that causes an undervaluation and exposes EPA to the risk of a financial short-fall. See Exhibit #USCdA119, page 4.

17. ***EPA And State Oversight Costs (Figure 6):*** EPA Region 10 has determined that its oversight costs represent about 2.3 percent of all contractor costs. In addition, the States of Idaho and Washington, tribes, and other entities who work in collaboration with EPA represent

another 2.3 percent of oversight costs. The present value for all oversight is \$67.6 million in year 2008 dollars. See Figure 6.

18. ***EPA Indirect Costs (Figure 6):*** EPA also incurs indirect costs, which are calculated and allocated by Region. The projected indirect cost rate for EPA Region 10 is 33.49 percent. I apply this rate to all future costs as EPA expects to assume responsibility for all future work. The EPA indirect costs based on the combined cashflow of all other activities total \$515 million in year 2008 dollars. See Figure 6. LECG appears to have largely ignored this cost element by only applying it to costs associated with Five-Year Reviews and EPA oversight. See Exhibit ## USCdA119, page 4; and USCdA116, Table 7.

19. In reviewing the LECG reports, including the original report and several supplements (see Exhibits #USCdA114-119), I determined that LECG has introduced numerous unsupported, low-cost alternatives and assigned high probabilities to them, biasing the expected value. For example, EPA's Comprehensive Remedy calls for additional remediation in the Upper and Lower Basins that is necessary to protect human health and the environment, and to meet statutory requirements. This is the most likely alternative recognized by the decision-maker at the Site. However, LECG delays implementation of any remedy beyond work currently specified in the 2002 Interim ROD for 30 years, and only then assigns a 30 percent probability to the likelihood of additional work and only a 10 percent likelihood that the entirety of Alternative 3 from the Final Feasibility Study, the basis for EPA's Comprehensive Remedy, will be implemented. See Exhibit #USCdA119, page 4 and Decision Tree #5. Therefore, LECG assigns only a 3 percent chance that EPA will complete the work EPA has stated is necessary and delays implementation in a manner that is neither efficient nor efficacious. LECG never assumes implementation of the Comprehensive Remedy from the onset, thereby significantly reducing the present value of the overall future cost estimate. Because LECG assumes a high real discount rate of 7 percent, delaying significant activities by 30 years dramatically lowers the

present value of costs and exposes EPA to the risk of having insufficient funds to complete work in the future.

20. Alternatively, LECG assumes that there is a 70 percent probability that the 2002 Interim ROD will be the final remedy, contrary to the findings of EPA in the Feasibility Study and in the 2002 Interim ROD. *Id.* NAS also noted in its 2005 Report that the Interim Remedy estimated to cost \$359 million will not complete the job. See Exhibit #USCdA016, page 2.

21. The ASTM International standard that LECG purports to rely on provides guidance on the best practice for estimating environmental costs. See Exhibit #USCdA036. LECG claims that its probability decision trees provide more comprehensive and robust estimates than the most likely value that I have employed. See Exhibit #USCdA117, pages 6 and 7. However, the standard clearly states that an expected value is not always the “best” estimate for a given set of circumstances. See Exhibit #USCdA036, Section 5.2.2 and Figure 7. Further, LECG violates the standard guidance by ignoring several key features of the standard. For example, Section 4.2.6 states the appropriate estimator is the individual or groups who “possess sufficient knowledge, training, and experience to develop appropriate estimates.” See Figure 8. EPA, who developed the Comprehensive Remedy, is the decision-maker with the most first-hand experience and knowledge of the Site but LECG did not give much weight to EPA’s plan. Further, EPA has taken into account the assessment of “potential risk to human health and the environment” (Section 4.2.5), but LECG does not explain how its more limited proposal would address these risks. See Figure 9. LECG provides no scientific, engineering, or legal analysis to support its estimates. See Exhibit #USCdA119. This is in direct contrast to EPA’s Comprehensive Remedy, which is based on the years of EPA’s investigation and analysis of the Basin as demonstrated in the Remedial Investigation/Feasibility Study (Exhibit #USCdA003).

22. The ASTM standard also states that the most current information should be used to develop costs, and that “improvements in estimates should be made as more information becomes available.” See Exhibit #USCdA036, Section 4.2.3, under Principles. In addition, the

standard's procedures clearly state that the estimator should consider "relevant state or other regulatory requirements and alternatives," "state or federal agency involvement," and "planned or completed remedial activities." See Exhibit #USCdA036, Sections 5.1.2.8, 5.1.2.9, and 5.1.2.11 under Procedures for Estimating Costs and Liabilities for Environmental Matters. By failing to take into account the agency decision-maker's preferred remedy, selected to protect human health and the environment, LECG has put forth an invalid range of values that excludes EPA's planned activities and financial obligations. Section 5.4.3 of the ASTM standard states that "when an expected value approach is not practical or appropriate, a mostly likely value could be developed using engineering estimates" especially when it is "a stated preferred remedy." See Figure 10. Merely adding irrelevant branches on a decision tree that bias costs low does not, in itself, provide a more robust and comprehensive analysis if the branches on the decision tree are not reasonable, are not based upon any defined or specific remedial actions, and do not capture what is likely to happen at the site. Essentially, LECG has violated a guideline for the standard's expected value approach: "The estimator should be careful to include realistic outcomes with statistically significant probabilities to avoid shifting the expected value through the addition of extreme outcomes with insignificant probabilities of occurrence." See Exhibit USCdA036, Section 5.4.2.2.

23. In summary, I conclude that future environmental remediation costs at the Site have an expected value of \$2,053,677,560 in present value dollars as of June 30, 2008. See Figure 11. The total of all past and future claims put forth by myself and other experts working on behalf of the U.S. Department of Justice is \$2,564,719,251.<sup>10</sup> See Figure 12 for a summary of these costs.

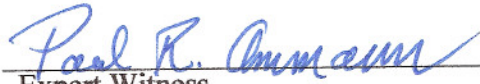
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<sup>10</sup> Prejudgment interest calculations will need to be unified at the time of trial.

**D. Exhibits to be Introduced in Support of Direct Testimony**

Demonstrative Exhibits that I may use to support my direct testimony are provided in Appendix A.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct. Executed this 2nd day of October, 2007 at Orleans, Massachusetts.

  
Expert Witness

## **APPENDIX A**

### **Demonstrative Exhibits for Paul R. Ammann**

# Schedule for EPA's Comprehensive Remedy

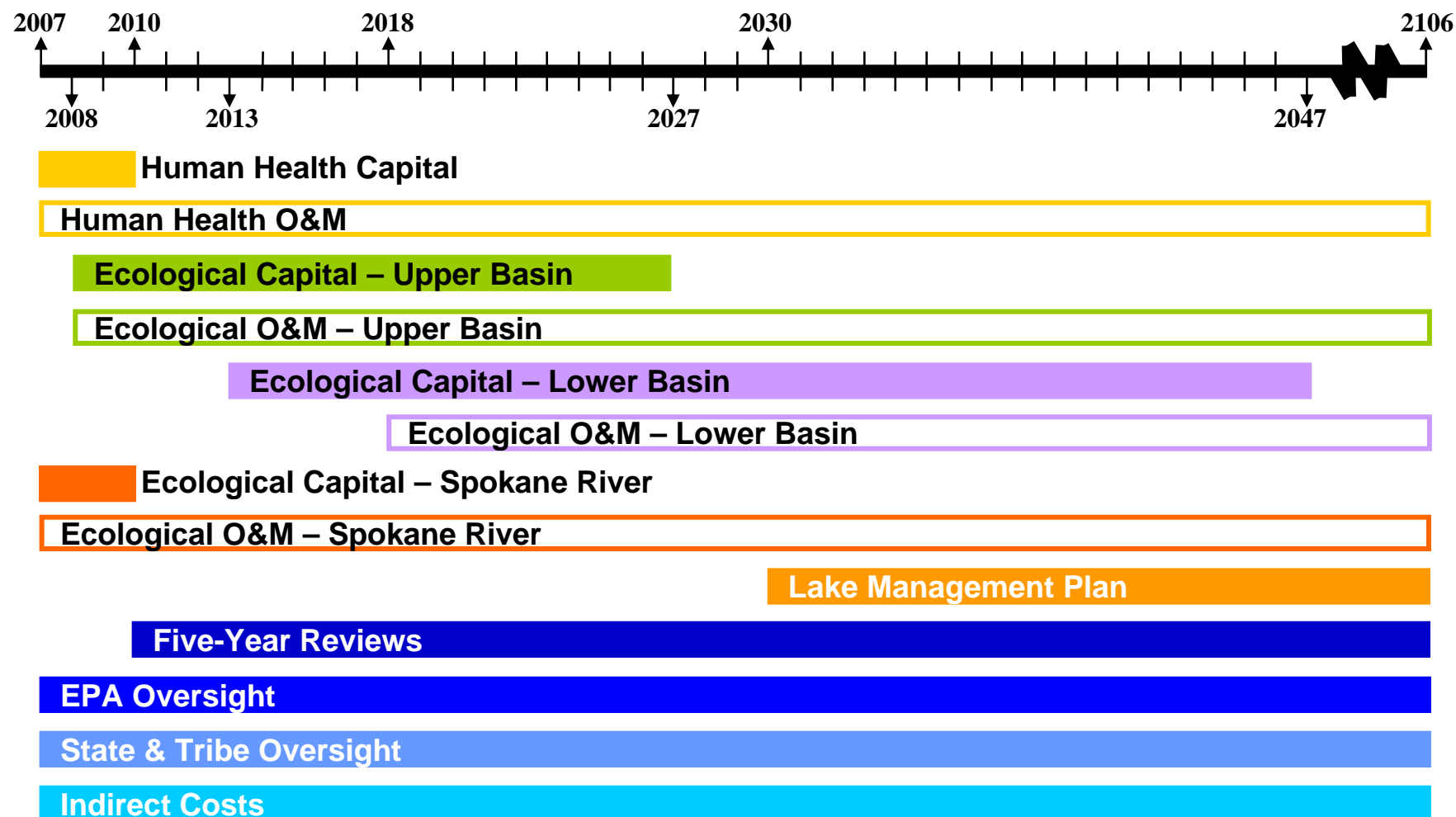


Figure 1

## Future Remedy

## Human Health

	Start	Stop	Present Value
Human Health Capital	2007	2010	\$139,629,327
Human Health O&M	2007	2106	24,633,763
Total			\$164,263,090

### Selected Activities:

- Clean-up of residential & commercial properties (including interiors), street right-of-ways, recreational areas
- Drinking water replacement
- Aquatic food sources sampling
- Information and Intervention Program

## Future Remedy

## Ecological — Upper Basin

	Start	Stop	Present Value
Upper Basin Capital	2008	2027	\$451,343,727
Upper Basin O&M	2008	2106	229,825,346
Total			\$681,169,073

### Selected Activities:

- Cleanup of abandoned mine and mill sites, adits, waste rock piles, tailings, and areas of contaminated floodplains
- Capping and vegetation to minimize surface water contact with waste ore and mill tailings
- Collection and treatment of ground and surface water

## Future Remedy

## Ecological — Lower Basin

	Start	Stop	Present Value
Lower Basin Capital	2013	2047	\$507,096,064
Lower Basin O&M	2018	2106	89,760,289
Total			<u>\$596,856,353</u>

### Selected Activities:

- Engineering and design phase for five years prior to starting remediation
- Remediation of the river banks and levees, the sediments in the river and the delta
- Remediation of sediments in lateral lakes

## Future Remedy

## Ecological — Spokane River

	Start	Stop	Present Value
Spokane River Capital	2007	2010	\$10,792,104
Spokane River O&M	2007	2106	4,826,506
Lake Management Plan	2030	2106	1,431,713
Total			\$17,050,323

### Selected Activities:

- Cleanup of selected areas on the Spokane River, revegetation, beach and surface water monitoring
- EPA may have to take responsibility for the Lake Management Plan in the future (10% likelihood)

## Future Remedy

## Site Wide Costs

	Start	Stop	Present Value
Five-Year Reviews	2010	2105	\$11,455,130
EPA Oversight	2007	2106	33,828,261
State & Tribe Oversight	2007	2106	33,828,261
Indirect Costs	2007	2106	515,227,069
Total			<u>\$594,338,721</u>

### Selected Activities:

- Required Five-Year Reviews indefinitely
- EPA direct and indirect costs related to project management and oversight

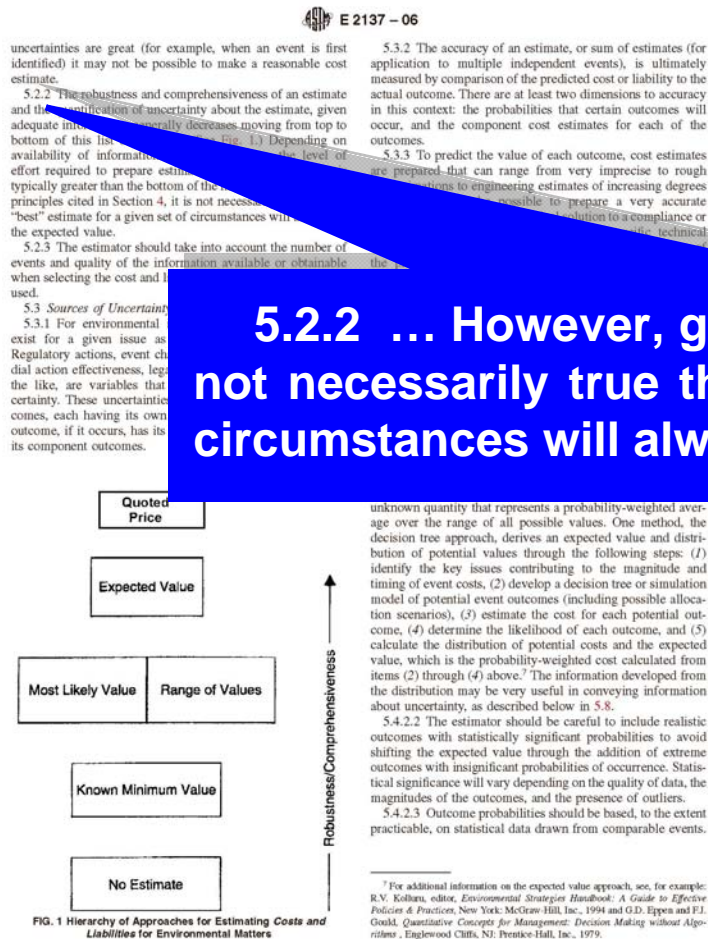


Figure 7

<p>at which the cost of obtaining information or the time required to gather it outweighs improvement in the quality of the estimate.</p> <p>4.2.5 <i>Assessment of Risk</i>—The actual or potential risk to human health and the environment should be considered in assessing environmental matters. The degree of risk should be a factor in developing the cost and liability estimates associated with those matters.</p> <p>4.2.6 <i>Estimator Selection</i>—An appropriate estimator or group of estimators will consist of those individuals or groups who possess sufficient knowledge, training, and experience to develop appropriate estimates for the costs and liabilities being estimated. It is the responsibility of the estimator to determine the appropriate level of knowledge, training, and experience for the parts of the estimation effort for which he or she is responsible.</p>	<p>5.1.2.9 State or federal agency involvement,</p> <p>5.1.2.10 Public involvement,</p> <p>5.1.2.11 Planned or completed remedial activities,</p> <p>5.1.2.12 Decision documents (for example, Records of Decision),</p> <p>5.1.2.13 Litigation activities related to the event (for example, claims, suits, actions, demands, requests for payment, notices),</p> <p>5.1.2.14 Resources, tasks, and deadlines,</p> <p>5.1.2.15 Available technologies and designs,</p> <p>5.1.2.16 Type and extent of contamination,</p> <p>5.1.2.17 Number of operable units (CERCLA) or solid waste management units (RCRA),</p> <p>5.1.2.18 Involvement of various parties at the event, and</p> <p>5.1.2.19 Information on prior experience with similar events.</p>
<p><b>5. Procedures for Estimating Costs and Liabilities for Environmental Matters</b></p> <p>5.1 <i>Determination of Relevant Costs and Liabilities</i></p> <p>5.1.1 There are many types of environmental matters, including:</p> <p>5.1.1.1 Studies,</p> <p>5.1.1.2 Response action under statutes as well as any internal policies,</p> <p>5.1.1.3 <i>Environmental costs</i> (for example, costs of estimated closure costs),</p> <p>5.1.1.4 Defense and legal fees,</p> <p>5.1.1.5 Fines and penalties,</p> <p>5.1.1.6 Reimbursement of costs,</p> <p>5.1.1.7 Damages arising from property damage, injury, or tort claims such as negligence,</p> <p>5.1.2 After identifying the costs and liabilities for environmental matters, the estimator should be able to identify the following:</p> <p>5.1.2.1 Event type (for example, release of hazardous materials, leaking storage tanks, compliance audit findings),</p> <p>5.1.2.2 Number and location of affected operations/facilities,</p> <p>5.1.2.3 Use of surrounding property,</p> <p>5.1.2.4 Past, current, and potential future site uses, and constraints imposed upon those future uses by AULs, including institutional controls and/or engineering controls,</p> <p>5.1.2.5 Studies,</p> <p>5.1.2.6 Environmental risks posed by the event,<sup>6</sup></p> <p>5.1.2.7 Bodily injury or other claims related to the event,</p> <p>5.1.2.8 Relevant state or other regulatory requirements and alternatives,</p>	<p>whether based on these requirements, significant costs and liabilities for environmental matters may be incurred that would indicate the need for further data creation and analysis in the future.</p> <p>5.2 <i>Selection of Estimation Approaches</i>—A decision framework for estimating costs and liabilities for environmental matters is required. For purposes of naming various estimating methods, the following terminology is used:</p> <p>Quoted Price Expected Value (EV) Most Likely Value (MLV) Range of Values Known Minimum Value</p> <p>5.2.1 The decision to use one or more of these five estimating methods or another method for a particular purpose is not arbitrary. The informational value of the estimate supplied by any one method is not equivalent to the others. When the</p>

**4.2.6 Estimator Selection — An appropriate estimator or group of estimators will consist of those individuals or groups who possess sufficient knowledge, training, and experience to develop appropriate estimates for the costs and liabilities being estimated....**

Figure 8

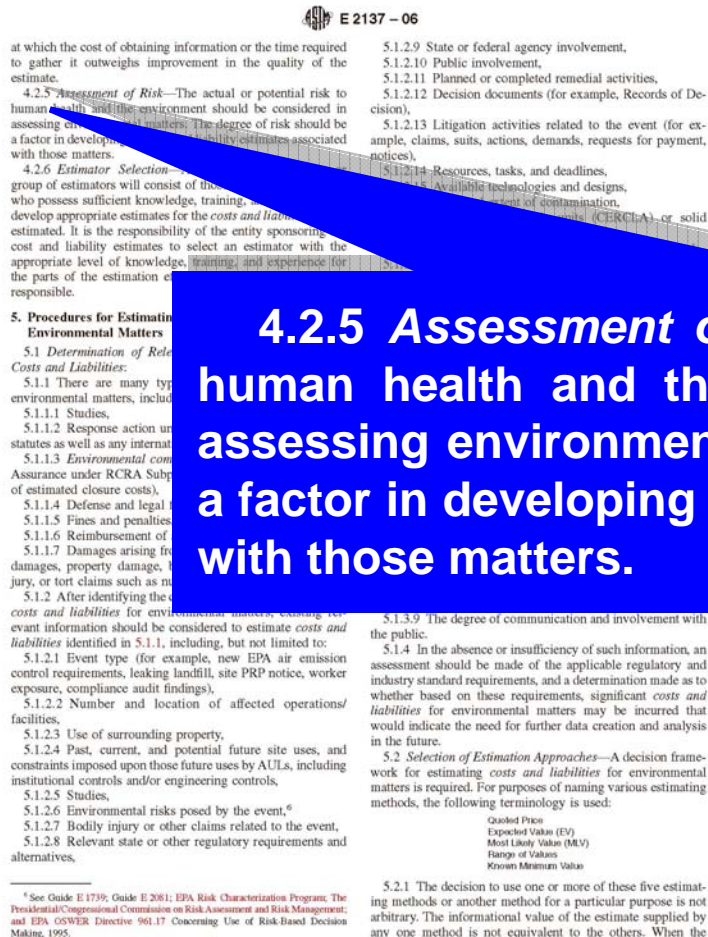


Figure 9

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Where there are a large number of events, statistical approaches to estimating the expected value may be particularly appropriate. It is important to realize statistical approaches can be predictive of aggregate *costs and liabilities*, even if expected values for individual events are at variance from the actual results.

**5.4.2.4** Another method for calculating an expected value is an actuarial approach, where historical data are available to estimate the expected value for similar events. Care should be taken when using historical data for estimating costs to assure that the data are applicable to the *event(s)* in question. Care should also be taken when using historical data due to the effects of changes such as technology enhancements, modified laws and/or regulatory policy, the changing application of presumptive remedies, and the application of risk-based corrective action approaches that could significantly alter current and future costs. Considerations should also be given to the potential loss of relevant information through application of statistical means or averages which may not convey information concerning uncertainty.

**5.4.2.5** These approaches can be used in combination as appropriate. Other approaches to estimating an expected value may include simulation modeling and Monte Carlo analysis, for example, to estimate cost distributions.

**5.4.3 Most Likely Value (MLV)**—When an expected value approach is not practical or appropriate, a most likely value could be developed using engineering estimates. This MLV captures the cost of the scenario believed to be most likely to occur (for example, a stated preferred remedy)....

**5.4.4 Range of Values**—When an expected value approach is not practical or appropriate, a range of values or a most likely value could be developed instead. This approach may also be used in addition to the MLV approach to provide additional information, or instead of the MLV approach if probabilities or rankings for various outcomes cannot be determined. The range of values should cover costs from a low cost estimate to a high cost estimate, based on reasonable assumptions. If some outcomes within the range are more probable than others, this standard recommends the additional estimation of a most likely value or an expected value, when possible.

**5.4.5 Known Minimum Value**—When the outcome and cost uncertainties are so great that it is premature to estimate a range of values or a most likely value, then a minimum value

including component costs (for example, contracts entered, initial studies) that are reasonably certain to be incurred should be estimated.

**5.5 Contingencies**—Contingency adjustments may be added to correct for costs that are undefined at the time of the estimate, but that are expected to be incurred. Therefore, care should be taken, when adding contingencies to base unit cost estimates, that the contingencies are reasonable and expected to be incurred.<sup>8</sup>

**5.6 Inflation and Discounting**—Inflation and discounting assumptions should be clearly documented. Inflation and discount rates should be appropriate to the cash flows being adjusted as well as their expected timing.<sup>9</sup>

**5.7 Allocation**—In estimates where *costs and liabilities* for environmental matters involve multiple parties, it may be necessary to apportion these costs among the parties. Determination of an entity's likely allocated share for an event should be made whenever sufficient information is available, and the allocated share should be factored into the cost estimates developed under 5.2. Private parties and courts have employed a variety of methods to allocate or apportion costs (See Appendix X3). As in the case with cost estimation, the method used to allocate costs is dependent upon the amount of information available and the event facts.

**5.4.3 Most Likely Value (MLV) — When an expected value approach is not practical or appropriate, a most likely value could be developed using engineering estimates. This MLV captures the cost of the scenario believed to be most likely to occur (for example, a stated preferred remedy)....**

as it communicates to the user of the estimate the potential amount of variability and/or the level of confidence in the expected value estimate. In some cases, the potential variability will be so great, or the level of confidence so low, that little value should be attached to the expected value estimate. It is important to those relying on expected value estimates prepared under this standard to be aware of such situations. When

<sup>8</sup> For additional information on contingencies, see for example F.D. Clark and A.B. Lorenzoni, *Applied Cost Engineering*, NY: Marcel Dekker, 1985, pp. 112-120.

<sup>9</sup> For additional information, see for example *Reference Manual on Scientific Evidence*, Second Edition, Federal Judicial Center, 2000, p. 300; R.A. Brealey, S.C. Myers and F. Allen, *Principles of Corporate Finance*, Boston: McGraw-Hill, eighth edition, 2006.

## Summary of Estimated Future Costs for EPA's Comprehensive Remedy

Item	Present Value (in 2008 dollars)
1 Human Health	\$164,263,090
2 Upper Basin	\$681,169,073
3 Lower Basin	\$596,856,353
4 Spokane River	\$15,618,610
5 Lake Management Plan	\$1,431,713
6 Five Year Reviews	\$11,455,130
7 EPA Oversight	\$33,828,261
8 State & Tribe Oversight	\$33,828,261
9 EPA Indirect Costs	\$515,227,069
<b>Total</b>	<b>\$2,053,677,560</b>

Figure 11

# Total Cost Estimate

# Coeur d'Alene Basin

Description	Cost*	Note Source
<b><u>Past Costs</u></b>		
Federal Agency Past Costs thru 3/31/2007	158,937,009	[1] Wiley Wright - #USCdA046
DOJ Past Costs thru 3/31/2007	21,081,921	[2] William M. Kime - #USCdA042
<b>Subtotal Past Costs</b>	<b>180,018,930</b>	
<b><u>Future Costs</u></b>		
Future Remedial Costs from 1/1/2007 thru 12/31/2106	2,053,677,560	[3] The Brattle Group - #USCdA032
Federal Agency Direct Past Costs from 1/1 thru 3/31/2007	(3,328,744)	[4] Wiley Wright - #USCdA046
DOJ Future Costs from 4/1 thru 10/9/2007	1,151,505	[5] William M. Kime - #USCdA042
Natural Resource Damages	333,200,000	[6] Joshua Lipton - #USCdA068
<b>Subtotal Future Costs</b>	<b>2,384,700,321</b>	
<b>Total</b>	<b>2,564,719,251</b>	

## Notes:

[1] The value includes costs incurred through 12/31/2006 and prejudgment interest calculated through 3/31/2007.

[2] This value does not include prejudgment interest

[3] This estimate is the expected value of the analysis presented in this report and are valued to mid-year 2008.

[4] The Federal Agency Direct Past Costs are subtracted to eliminate possible duplicative costs captured in the Future Cost Estimate starting 1/1/2007.

[5] This value does not include prejudgment interest.

[6] Damages are in year 2008 dollars.

\* The prejudgment interest calculation will be updated to the date of payout on claim.